

Waxing Techniques to Develop Proper Occlusal Morphology in Different Occlusal Schemes

Mulay Gauri · Dugal Ramandeep

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Abstract Static and dynamic occlusal interferences frequently need to be corrected by selective grinding of the occlusal surface of conventional cast, porcelain fused to metal and all-ceramic restorations. Proper dimensional contours and occlusal morphologies of these restorations is an important consideration in overall success of the case. Various types of occlusal morphologies and contact relationships of posterior reconstructions are dependent on the occlusal schemes (Cusp-fossa or Cusp-marginal ridge) and the requirements of the patient's masticatory system. While much has been said and deliberated about the occlusal schemes, little is spoken about its development using intricate waxing techniques. There are various waxing techniques described in the literature which give a detailed description of the steps, methodology and instrumentation used for waxing of occlusal forms. The role of using such intricate waxing techniques cannot be overemphasized. Discussed in this article are the different techniques to be used in developing appropriate occlusal morphology and is supported by suitable case presentations.

Keywords Occlusal scheme · Occlusal morphology · Tripodal contact · Triangular ridge · Stable occlusion

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M. Gauri (✉)
Department of Prosthodontics, Sinhgad Dental College and Hospital, S.No 44/1, Vadgaon (Bk), Off Sinhgad Road, Pune 411041, India
e-mail: gaurimulay@hotmail.com

D. Ramandeep
Department of Prosthodontics, M.A.Rangoonwala College of Dental Sciences and Research Centre, Pune, India

Introduction

Properly formed occlusal morphology gives correct form, function, and esthetics to the prosthesis. Understanding of few simple principles of different occlusal schemes will be of a great value in preventing some of the failures which occur with the restorations that replace occlusal surfaces.

Occlusal Schemes

Occlusal schemes are basically classified on the basis of contact made by the functional cusp on the opposing tooth in the centric relation [1]. Accordingly they are classified into-

- 1 *Cusp to fossa occlusal scheme* In this scheme functional cusp contacts only the opposing fossa in the centric relation. It is the tooth to tooth type of arrangement. Hence forces are directed parallel to the long axis of the tooth and also near the center of the tooth, thus minimizing lateral stresses. But since it is rarely seen in the natural dentition it can only be given in cases of full mouth reconstruction.
- 2 *Cusp to marginal ridge occlusal scheme* In this scheme, the functional cusp contacts the fossa and marginal ridge of opposing pair of teeth. Thus this is one tooth to two teeth type of an arrangement. It is the most commonly found scheme, almost in 95% of adult patients. Hence commonly practiced for constructing single unit restorations or small span fixed partial dentures.

Importance of Occlusal Morphology

Properly formed occlusal surface allows for small centric contacts which disocclude completely during the lateral

excursive movements of the mandible thus minimizing lateral stresses and frictional wear. While in case of the occlusal surface which is formed only by the inclined planes centric contacts formed are large and teeth do not disocclude completely during the excursive movements of the mandible [2].

Types of Centric Contacts

There are three basic ways by which centric contacts are usually established [3].

- 1 *Surface to surface contact* Not recommended because it is stressful and it produces lateral interferences.
- 2 *Tripod contact* In tripod contact the tip of the cusp never touches the opposing tooth. Instead, contact is made on the sides of the cusps which are convexly shaped. It is a stable contact.
- 3 *Cusp tip to fossa contact* In this the cusp tip is properly located in the most advantageous fossa. It offers good function and stability. This type of occlusion is easy to equilibrate.

Aims and Objectives of Selecting Correct Occlusal Scheme and Giving Correct Occlusal Morphology While Restoring Patients' Teeth are

- 1 To direct the occlusal forces properly by minimizing lateral forces during excursive movements of the mandible.
- 2 To make the occlusion stable.
- 3 To increase the masticatory efficiency.
- 4 To reduce the frictional wear.

Discussed below are the different waxing techniques to achieve two different occlusal schemes

Armamentarium required for the waxing technique is a set of PKT (P.K. Thomas) instruments (Fig. 1). Set comprises of five instruments. PKT No. 1 is used for positioning of functional and non functional cusps. The marginal, cusp and triangular ridges are also added with PKT No. 1. PKT No. 2 is used for eliminating voids remaining on the occlusal surface. Developmental and supplemental grooves are smoothed with PKT No. 3. Smoothing of axial surfaces is done with PKT No. 4. And PKT No. 5 is used to refine the ridges [4] (Fig. 2).

Waxing Technique to Develop Cusp to Marginal Ridge Relationship

To develop this relationship, functional waxing technique given by E.V.Payne is used. It was the first wax added technique [5] (Fig. 3).

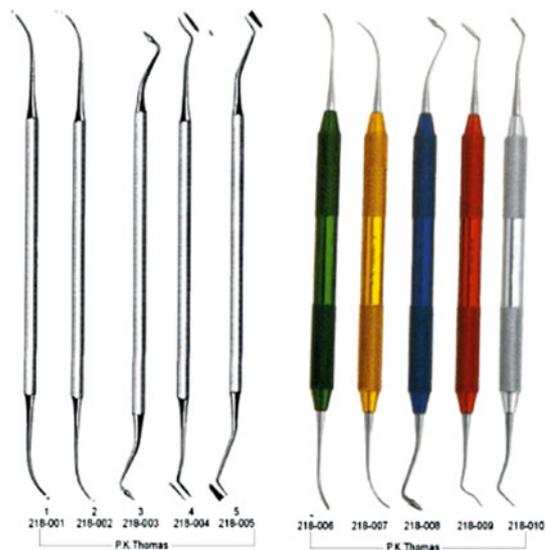


Fig. 1 PK Thomas set of instruments

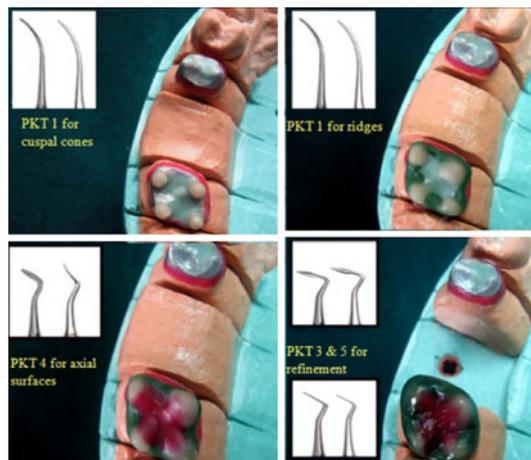


Fig. 2 Waxing technique using PKT instruments



Fig. 3 Wax pattern showing cusp to marginal ridge relationship

Steps involved in the technique are [1, 2, 6]:

1. Functional and non functional cusps are located. Wax cones are placed for these cusps with PKT No. 1. Cones for non functional cusps should be shorter than functional cusps to provide easy disocclusion during excursion. Articulator is closed and moved in various lateral and protrusive movements to obtain optimal heights for the cuspal cones [6].
2. Then the marginal and axial ridges are added with PKT No. 1. Marginal ridges should never be at a higher level than cuspal cones. And proximal contacts with posterior natural teeth are located in the occlusal thirds of the pattern [7].
3. Triangular ridges are added next. They are necessarily triangular in shape extending from central groove to the cuspal tip. Tip of the triangular ridge is at the cusp tip and base in the central groove. They are convex buccolingually and mesiodistally. If triangular ridges are developed correctly proper groove pattern will occur as a natural by-product. Articulated casts are moved in all the excursions and unwanted contacts are removed. Axial contours are then developed with PKT No. 4. Straight profile should be developed in the gingival third of the axial contour [8, 9]. Overcontouring should be avoided because of its destructive potential [10].
4. Finally grooves are smoothed with PKT No. 3 and marginal ridges are smoothed with PKT No. 5 to form the refined final wax pattern with proper occlusal morphology (Fig. 4).
5. Zinc Stearate powder is dusted on the wax pattern intermittently before checking the occlusal contacts.
6. The contacts formed by each opposing cusp should form a tripod configuration (Fig. 5).
7. Margin finishing is done last. Margin should be checked carefully for the following discrepancies:
 - a. Overwaxed margins
 - b. Short margins
 - c. Ripples
 - d. Thick margins
 - e. Open margins



Fig. 4 Occlusal morphology of the wax pattern

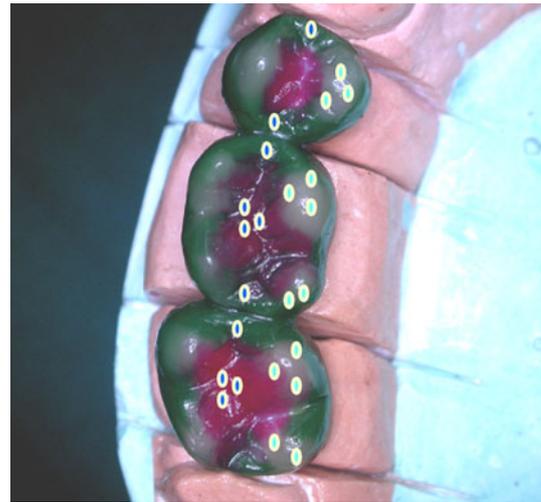


Fig. 5 Tripodal occlusal contacts

- c. Ripples
- d. Thick margins
- e. Open margins

Margin is critically important area of every wax pattern. It should be carefully inspected for its fit and extension.

Clinical Case of Full Mouth Reconstruction Where Cusp to Fossa Occlusal Scheme was Developed (Fig. 6)

Waxing technique to achieve this occlusal scheme was developed by P.K.Thomas [11].

In this occlusal scheme, mandibular functional cusps arise opposite the middle of maxillary teeth; similarly maxillary functional cusps are positioned half way between the mandibular buccal and lingual cusp tips. Hence occlusal forces are transmitted parallel to long axes of teeth.

The development of a cusp to fossa occlusion is best accomplished by waxing two opposing quadrants simultaneously in the following sequence [1].



Fig. 6 Cusp to fossa relationship

1. Location of cusps and the contacts made by the cusps are identified and marked on the casts.
2. Cones are placed for the mandibular functional cusps first. They should be located approximately one third the distance from the buccal to lingual surface. Also they should fall into appropriate fossae mesiodistally.
3. Then the cones for maxillary palatal cusps are placed.
4. Next non functional cusps are placed, i.e. maxillary buccal and mandibular lingual.
5. Then marginal ridges, cuspal ridges are developed simultaneously for opposing teeth.
6. Dust the occlusal surfaces with zinc stearate and close the casts together on the articulator to remove unwanted contacts. Each centric cusp should make contact with the occlusal fossa of the opposing tooth at three points, the tripodal contact Figs. 7 and 8.
7. Finishing of the margins is done last.



Fig. 7 Tripodal occlusal contacts on maxillary teeth



Fig. 8 Tripodal occlusal contacts on mandibular teeth

Discussion

There are certain morphological differences which need to be carved while doing wax ups to achieve cusp to fossa occlusion [1]. These differences are:

In Mandibular Teeth

1. During working excursion, buccal cusp of each maxillary premolar will pass distal to the buccal cusp of each mandibular premolar. To facilitate easy and rapid disocclusion, it is necessary to place a small depression in the form of notch on the distal incline of buccal cusp of each mandibular premolar. This notch is referred as Thomas notch (Fig. 9).
2. During non working excursive movement of the mandible, mesiopalatal cusp of maxillary molar passes through the area distal to the distobuccal cusp of mandibular molar. A notch is developed to form three buccal cusps in both the mandibular molars to prevent this non working interference (Fig. 9).
3. Lingual cusps of mandibular molars and premolars should be short enough to allow easy and rapid disocclusion [12].

In Maxillary Teeth

During non working excursive movement of the mandible, distobuccal cusp of mandibular molar moves in a mesio-lingual direction across the buccal incline of mesiopalatal cusp of maxillary first molar. To provide the escape way for opposing cusp, it is necessary to place a groove on the mesiopalatal cusp of maxillary 1st molar. It is referred as Stuart's groove (Fig. 10). All these changes in the wax pattern provide stable occlusion.

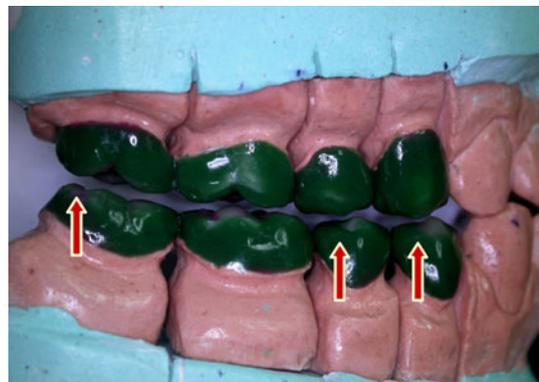


Fig. 9 Thomas notch on premolars and three buccal cusps on mandibular second molar

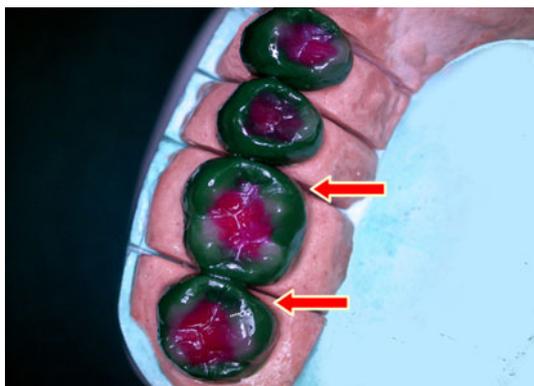


Fig. 10 Stuart's groove on maxillary molars

Conclusion

Long term success of the restoration is mainly dependant on the maintenance of occlusal harmony.

Restorations which are fabricated without accurate occlusal morphologies will have some inaccuracies. They may then be corrected in the mouth at the cost of valuable chair time resulting in an occlusion which is less optimal.

Thus whenever multiple restorations are fabricated there is a need for planning correct occlusal scheme and the necessary morphological changes should be carried out at the wax up stage itself to establish the stable occlusion.

References

1. Shillenburg HT, Hobo S, whittset LD, Jacobi R, Brackett SE (1997) *Fundamentals of fixed prosthodontics*, 3rd edn. Quintessence, Carol Stream, pp 340–353
2. Shillenburg HT, Wilson EL, Morrison JT (2000) *Guide to occlusal waxing*, 3rd edn. Quintessence, Chicago
3. Shillenburg HT, Wilson EL, Morrison JT. *Guide to occlusal waxing*, 3rd edn. Quintessence, Chicago, pp 22–25
4. Dawson Peter E (1974) *Evaluation, diagnosis & treatment of occlusal problem*. C.V Mosby Company, St Louis, p 207
5. Huffman RW (1969) *Occlusal morphology*. In: Guichet NF (ed) *Procedures for occlusal treatment—a teaching atlas*. Denar corp, Anaheim, p 98
6. Tamura K (1987) *Essentials of dental technology*. Quintessence, Inc., Chicago
7. Burch JG, Miller JB (1973) *Evaluating crown contours of a wax pattern*. *J Prosthet Dent* 30(04):454–458
8. Tjan AHL, Freed H, Miller GD (1980) *Current controversies in axial contour design*. *J Prosthet D* 44:523–525
9. Koidis PT, Burch JG, Melfi RC (1987) *Clinical crown contours: contemporary view*. *J Am Dent Assoc* 114:792–795
10. Jameson LM, Malone FP (1982) *Crown contours & gingival response*. *J Prosthet Dent* 47:620–624
11. Thomas PK (1967) *Syllabus on full mouth waxing technique for rehabilitation*. Instant Printing Services, San Diego
12. Shillenburg HT, Kaplan MJ, Grace CS (1972) *Tooth dimensions—a comparative study*. *J South Calif Dent Assoc* 40: 830–839